Chapter viii. is occupied with the method and progress of determining the motions of approach or recession of celestial bodies by Doppler's principle of changes of wave-length.

The great field of solar observation is very efficiently summarised in chapters ix., x., and xi., including the new results obtained by the use of the spectroheliograph (a simple diagram such as is often used would have been of value in rendering the explanation of this instrument much easier); the phenomena of the prominences and reversing layer during a total solar eclipse; the sun's rotation and that of the various planets. In chapter xi. particular attention is given to the spectra of terrestrial atmospheric phenomena by the detection of special features in the solar spectrum at different altitudes.

Chapter xii. is devoted to a short outline of the methods of investigating long wave radiations. The inductive method of presenting the reasoning is very acceptable, and the beginner who has mastered the subject so far will be well equipped for entering on the more advanced branches of this intricate section of spectroscopy.

The concluding three chapters deal with the physical sections of spectroscopy. The various systems of harmonic laws found so closely to represent certain types of spectra are well described. Perhaps in the presentation of the diagrams to illustrate these it would have been preferable to adopt the same scheme of orientation for the spectra. Thus in Fig. 46 the red end is to the right, with all the lines of the series converging to the left or violet; while in Fig. 47 the red end is towards the left, and although the series lines really converge to the violet as before, it is confusing for a beginner to have to find that things are all turned the opposite way. This is all the more important from the fact that there are series actually converging in opposite directions. The phenomena of diffraction and general use of gratings for producing spectra are next given, though necessarily condensed. In a manual avowedly written to induce readers to repeat the experiments, mention might well have been made of the fact that excellent replicas of original Rowland gratings, both plane and concave, are now readily obtainable at a moderate price, as it is not often that an original grating is available for general experimental purposes.

It will have been noticed that the description of the application of the spectroscope has been almost confined to its astronomical aspects; it should not be forgotten that spectroscopic analysis is at present playing an important part in the chemical and metallurgical industries.

Eight plates are given at the end of the book, showing various representative spectra. There is also a large coloured plate as frontispiece showing certain elemental and other spectra.

It will be evident from this summary that the book under review should serve as a most useful introduction to the study of spectrum analysis. It appropriately fills a position between the elementary primer with little or no technical information and the more formidable complete treatises which are admittedly repellent to the beginner.

THE THEORY OF METALLOGRAPHY.

Metallography. By Dr. Cecil H. Desch. Pp. x+429. (London: Longmans, Green and Co., 1910.) Price 9*s*.

DR. DESCH has evidently been at great pains to compile a work that shall give a fair idea of the subject as a whole as it appeals to him, and he is, above all, a theorist. It is a difficult work for the writer to review, for two reasons: because it covers practically the whole range of this enormous subject and is therefore necessarily dogmatic on many matters that, if disagreeing with the author, it would need much space to discuss adequately; and, secondly, because he dismisses the whole Sheffield School thus:—"This (the Osmond) hypothesis has been generally accepted as the best expression of the known facts, in spite of strong opposition from a (the Sheffield) school of metallurgists . . ." although on pp. 363 and 364 we find rather contradictory opinions, such as "β-iron was originally described by Osmond as a hard variety of iron. It is more correct to say that it is capable of forming solid solutions with carbon, which become hard under certain conditions of cooling."

The "eutectic-times" method for fixing the eutectic composition was used by Arnold in his "Influence of Carbon on Iron" (Proc., Inst. C.E., 1895–6, part i.), although Tammann is credited with its first use in 1903 (p. 18).

The author might with profit study "The Diffusion of Elements in Iron," by Arnold and McWilliam, I.S.I., 1899, No. 1, instead of the preliminary announcement of 1898, which he quotes, and besides further details on diffusion would find that these authors used the quenching method then, in an endeavour to judge of the condition of the carbon, &c., at high temperatures. Also in connection with the method of changing structure from that showing Widmanstätten figures to granular, the author credits the discovery to Fraenkel and Tammann in 1908, whereas the fundamentals of the matter were first published by Arnold and McWilliam in NATURE, November 10, 1904, p. 32.

A good account is given of the diagram of thermal equilibrium, and on p. 32 it is pointed out that the intermetallic compounds do not conform to our ideas of valency.

The sixth chapter is a good one on practical pyrometry and thermal analysis, but actual work on the subject, and recent discussions have surely at last made it plain, that the author is entirely mistaken in his statement on p. 126 that "In accurate work on the transformations of solids, however, one or other of the difference methods is almost invariably adopted." As recently as the Buxton meeting of the Iron and Steel Institute, September, 1910, it was distinctly shown that in a 0·2 per cent. carbon steel the best workers by the difference method do not divide the Ar_2 point, whilst those working with the present modifications of Osmond's inverse-rate method divided the A_2 point with ease, absolutely proving the superiority of the latter method.

Chapters vii. to xiii. deal with the preparation of micro-sections; crystallisation of metals and alloys;

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under-cooling and the metastable state; diffusion in the solid state; physical properties of alloys; and electromotive force and corrosion. In chapter xiv. the construction of the equilibrium diagram is clearly explained, and the remainder of the book deals with the condition of metals in alloys, plastic deformation, the metallography of iron and steel, and the metallography of industrial alloys.

The present writer has made many notes on points in these chapters, as p. 222, "white cast-iron, martensite and cementite," instead of pearlite and cementite. The anthor is good on the difficult subject of hardness. P. 276, aluminium alloys have "a lower hysteresis than the purest specimens of iron . . . probably due to . . . removing oxygen." This is more likely to be due to the larger crystals formed, and the author, in such a theoretical work, might use the term "crystal" occasionally instead of "crystal grain."

In the chapter on the metallography of iron and steel there is so much that is erroneous that it is impossible to deal with it properly, but as an example the statement on p. 374 that "A tool steel containing 1 6 per cent. carbon, quenched from 800° C. in ice-water, consists of pure martensite," is meaningless.

The work is, however, one that every student of metallography should possess, for although there are so many points in it with which one does not agree, the author has given on the whole a fair account of theoretical matters connected with metallography, has scoured the literature of the subject, even extending to Russian, and has given copious references which must prove useful to those investigating the problems of metallography, who desire with a minimum expenditure of time to find out what has been done on their particular branch. A. McWILLIAM.

PHYSIOLOGICAL CHEMISTRY.

Practical Physiological Chemistry. By Dr. R. H. Aders Plimmer. Pp. viii+270. (London: Longmans, Green and Co., 1910.) Price 6s. net.

THIS is really the second edition of Dr. Aders Plimmer's excellent manual. The first appearance of the book was privately printed for use in the practical classes of physiological chemistry at University College, London, but a good many copies were distributed to other teachers, and to the Press. A favourable notice of this preliminary edition appeared in the pages of NATURE at the time. The publication of the book for general sale is an indication of the way in which the teachers of the subject welcomed the new departure in the presentation of the subject. For it is a new departure; hitherto works on the subject have been written by physiologists; the present book is written by a chemist; it is physiological chemistry as opposed to chemical physiology.

The increasing exactitude of knowledge in the chemistry of those carbon compounds which are the constituents or products of living matter warrants the appearance of a book written to show that physiological chemistry is only a branch of organic chemistry, and Dr. Aders Plimmers has been successful in showing the connection of the two by the insertion of the appropriate and logical links which unite the introductory chapters on organic chemistry proper with its daughter science.

The main aim of the work is to make it a trustworthy practical guide, and no laboratory worker can afford to be without it. Its ideal is that every student shall work through all the exercises; these are set out with detail and in a clear manner, so that there is no reason why the student should fail to do so under his teachers, except that of time, and time is a very important factor for students of medicine, to whom the work is primarily addressed. In the medical curriculum, the number of subjects is growing every year, and each one of these is expanding and seeking to encroach more and more on the unfortunate student's already too-full day. Teachers are already seeking means to limit in particular certain preliminary subjects, and to exclude those portions which have but little direct bearing on his future practical life. There is no subject, however, which has such a direct bearing on medical practice as physiological chemistry; its relationships to pathology become clearer with every advance in knowledge; if there is one subject more than any other which should not be curtailed, that subject is physiological chemistry. W. D. H.

SYSTEMATIC BOTANY.

Das Pflanzenreich. Regni vegetabilis conspectus. Edited by A. Engler. Vol. iv., pt. 104. *Papaveraceae-Hypecoideae* et *Papaveraceae-Papaveroideae.* By Friedrich Fedde. Pp. 430. (Leipzig: W. Engelmann, 1909.) Price 21.60 marks.

THIS volume forms the fortieth part of the great series of monographs in course of publication under Dr. Engler's editorship. It comprises the family Papaveraceæ as understood in the restricted sense, that is, without the Fumariaceæ; the account of these will be issued subsequently as Papaveraceæ-Fumarioideæ. The special portion of the work, the systematic treatment of genera and species, is preceded by a general account of the family occupying eighty-three pages, in which Dr. Fedde discusses the morphology and anatomy of the vegetative organs, with special reference to the value for systematic purposes of the anatomical characters; the position of the laticiferous vessels and the character of the latex is found most helpful in this respect. The floral structure and its modifications are discussed at considerable length, and also the fruit, especially the various mechanisms of dehiscence. There is also a useful section on geographical distribution, a discussion of the affinities of the family, and an account of its economic uses.

The great value of these monographs lies, however, in the systematic portion, which should represent the results of the work of an expert student of the family on all the available material. Dr. Fedde is known as an authority on the Papaveraceæ, and we look to his monograph for a careful and considered systematic presentation of the family. It is somewhat surprising therefore to note the treatment of the earlier genera of Papaveroideæ which, as Platystemon and Eschscholtzia, are confined to Pacific North America. In

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